Blast and Impact Research

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Blastech

Blast and Impact Engineering at Sheffield

- Site is an old WWII munitions store
- Partially buried concrete bunkers

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Buxton Laboratory – Test Facilities

- The Buxton lab has the following test facilities:
  - **External blast test arena** (up to 3kg TNT)
    - (arrangements can be made for up to 15kg TNT tests on an adjacent site)
  - **Internal blast test arena** (up to 0.3kg TNT)
  - **6m² "Blast box"** for confined gas and HE explosions
  - **Ballistics ranges** from small arms to 20mm calibre

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Buxton Laboratory – Test Facilities

- The Buxton lab has the following test facilities:
  - **Pneumatic load rig** (up to 50T load, 5ms rise time)
  - **Hopkinson pressure bar** (dynamic material properties)
  - **Hypersonic impact test arena** (EFP, Lined/Unlined shaped charge – several 1000 m/s projectiles)

Buxton Laboratory – Test Facilities

- Extensive range of experimental:
  - Flash radiography
  - High speed video/stereo DIC systems
  - >50 channels , >1MHz data acquisition systems
  - Pressure transducers, accelerometers, displacement transducers etc
  - On-site machining workshop

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Buxton Laboratory – Experience

- Experimental studies of structural response to blast and impact has been conducted at the Buxton lab for >30 years.
- Experimental work often associated with validation of numerical modelling of blast/impact events
- Extensive experience of working with DSTL and its forebears

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Buxton Laboratory – Research

- Can work as a facility for conducting high-quality, high-control experimental work for validation of numerical modelling
- Main current fundamental research theme – characterisation of loading from blast events

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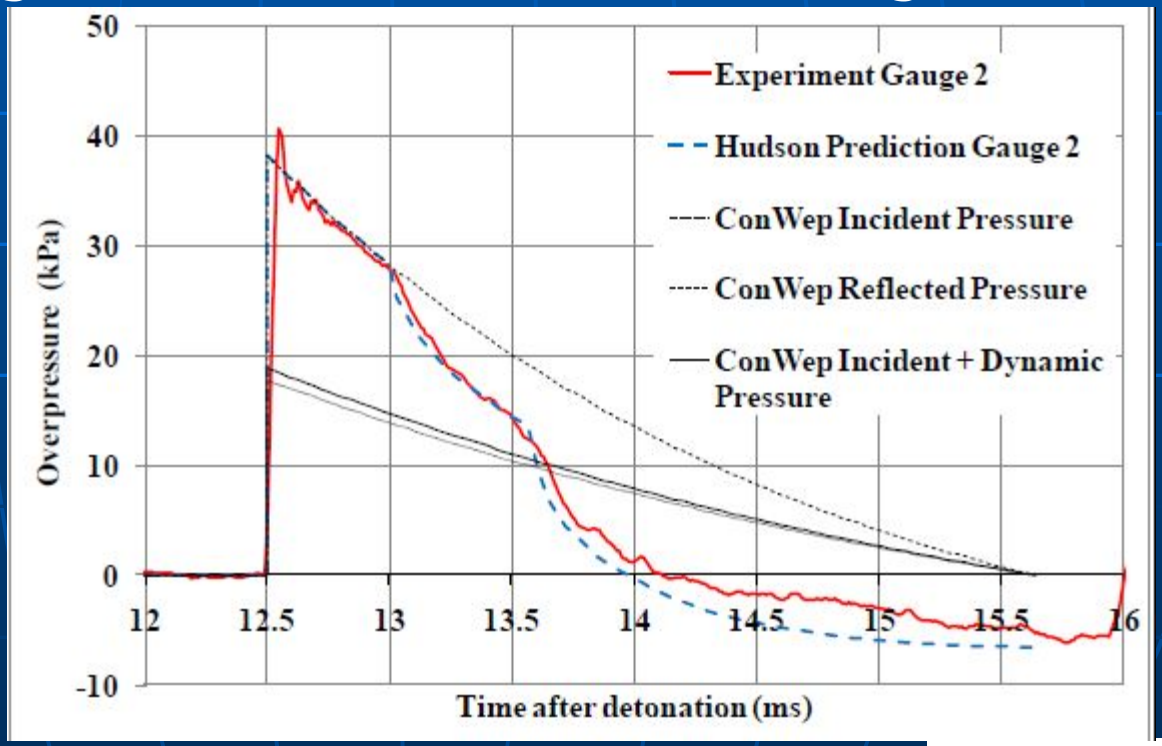
Buxton Laboratory – Research

- Validation of simple predictive models for the effect of blast clearing from boundaries of finite targets



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Buxton Laboratory – Research

- Characterisation of loading from shallow-buried explosive charges

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DSTL-UoS Meeting – 5 Sept 2012 – Blast & Impact Research at UoS

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Buxton Laboratory – Research

- Previous published work shows a huge spread of loading from nominally identical tests

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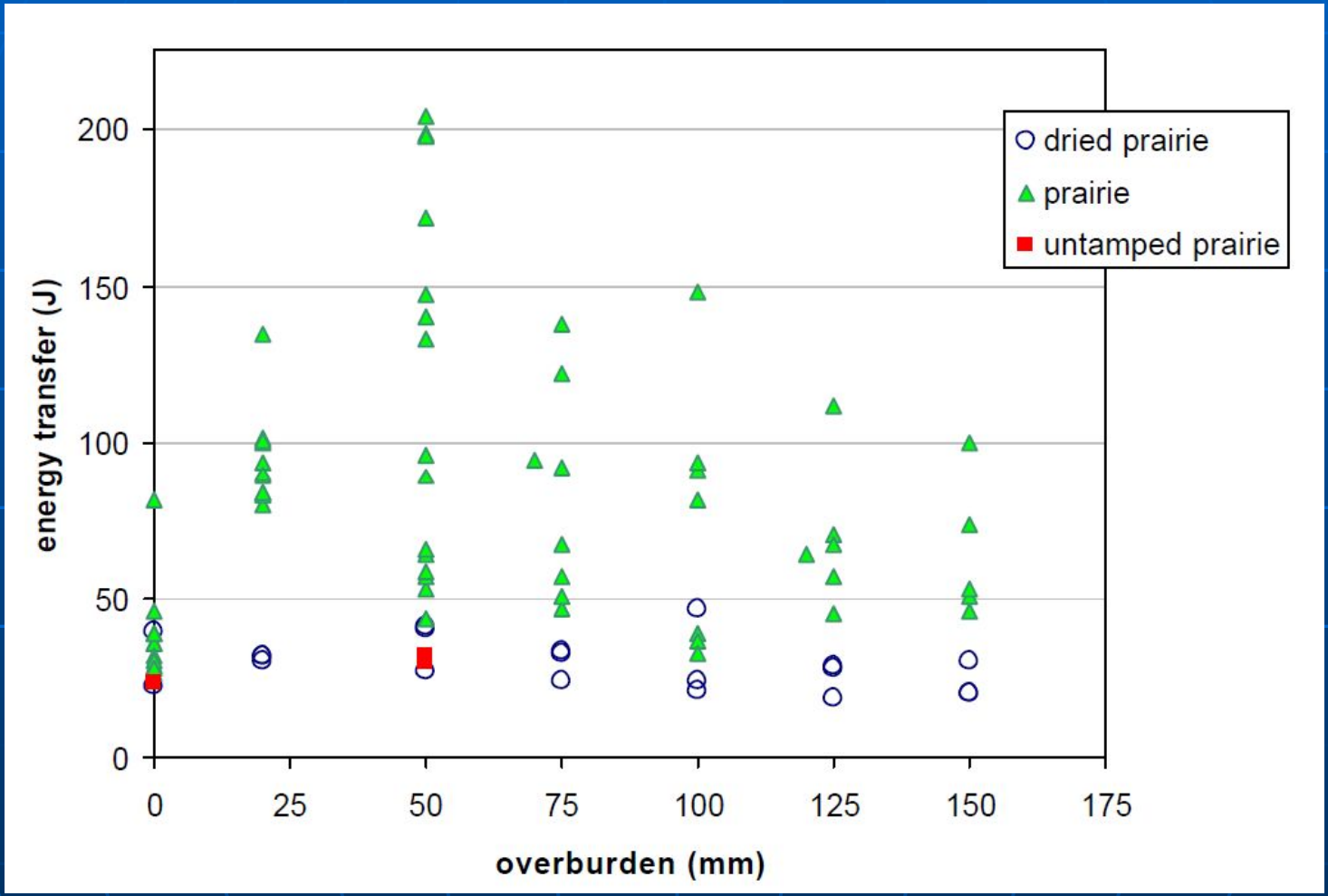

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Buxton Laboratory – Research

- With very careful control over test arrangement and geotechincal preparation, we get a high level of repeatability

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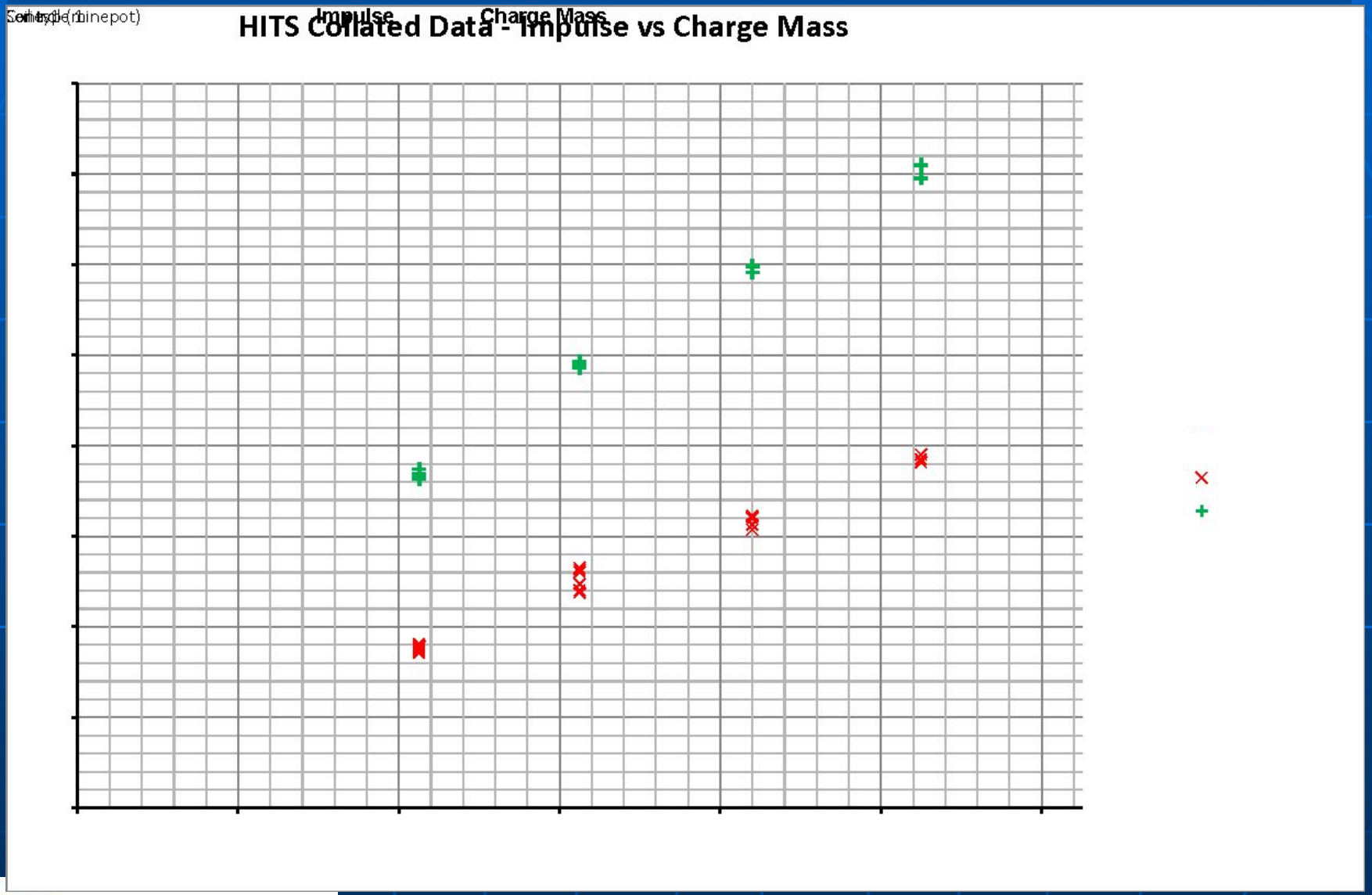
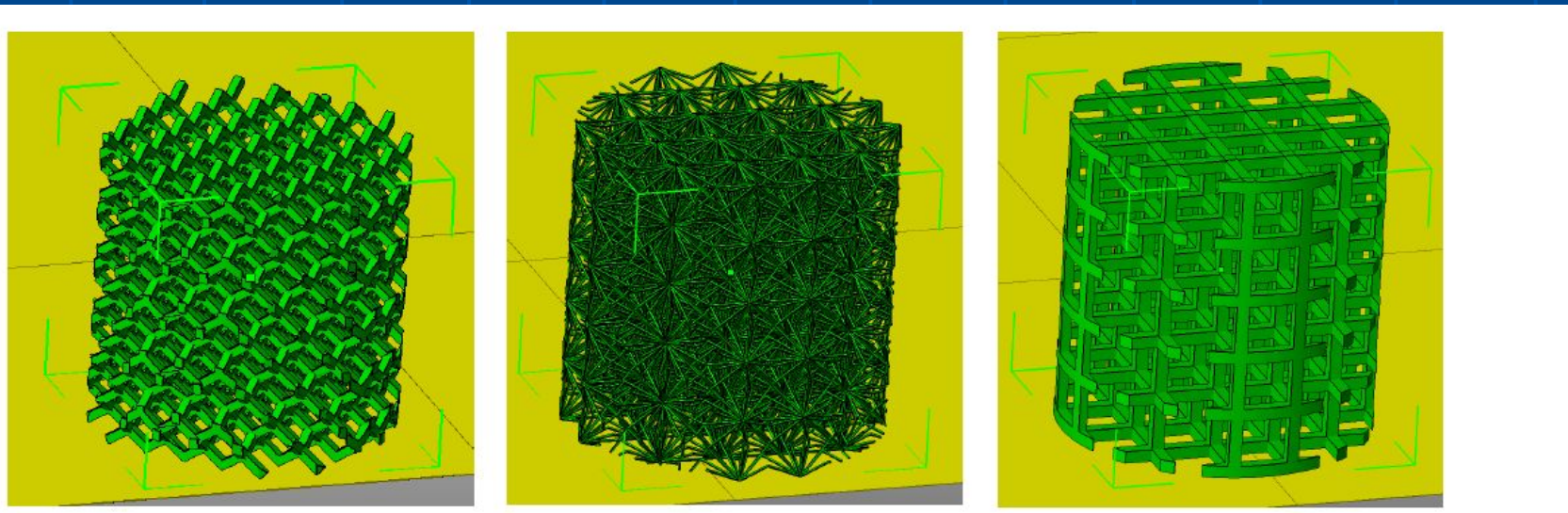

Impulse
Charge Mass
HITS Collated Data - Impulse vs Charge Mass

Buxton Laboratory – Research

- Impact behaviour of titanium micro-lattice materials
- CDE funded short project in 2011
- Impact behaviour experimentally studied at velocities 5-300m/s



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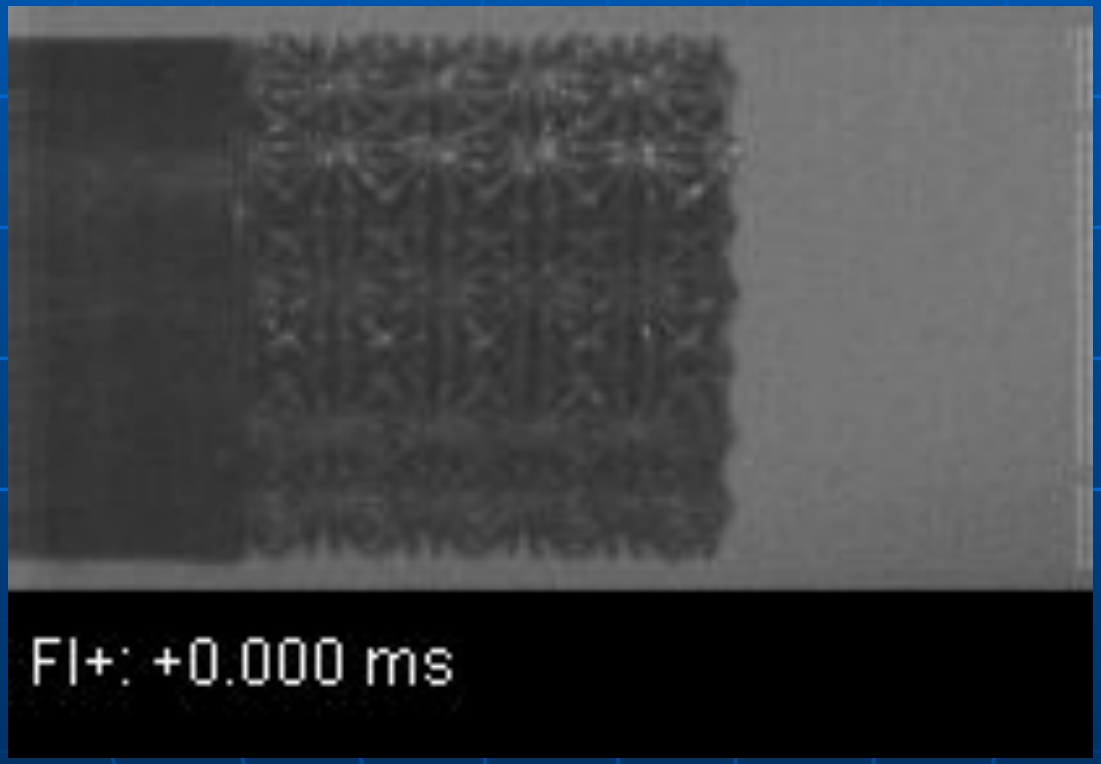

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Buxton Laboratory – Research

- Impact behaviour of titanium micro-lattice materials
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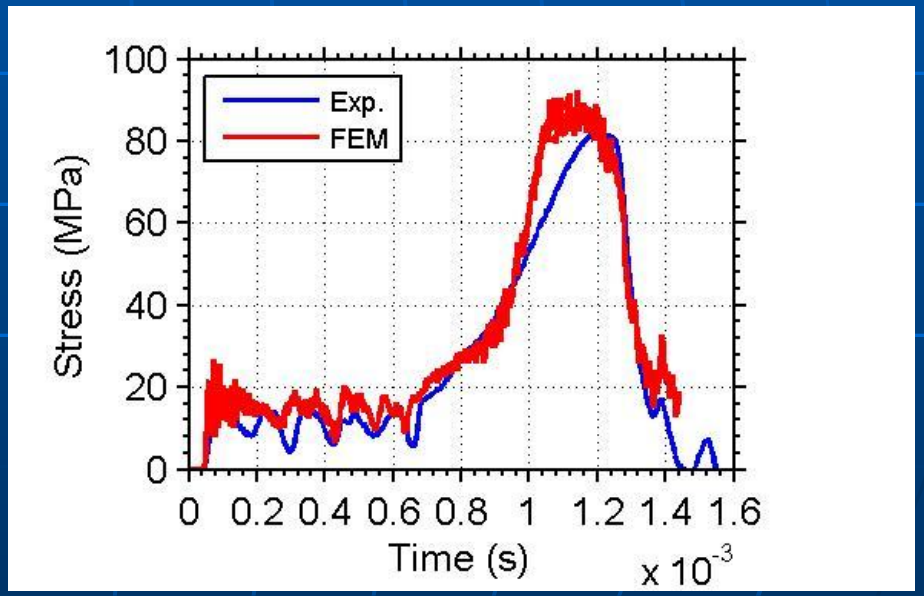
- Explicit beam-element modelling capability developed and validated

- Now developing an MDoF model to allow us to optimise the micro-lattice properties for given impact events



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